Stray Creek project
Carbon Cycling and Storage Analysis

Introduction

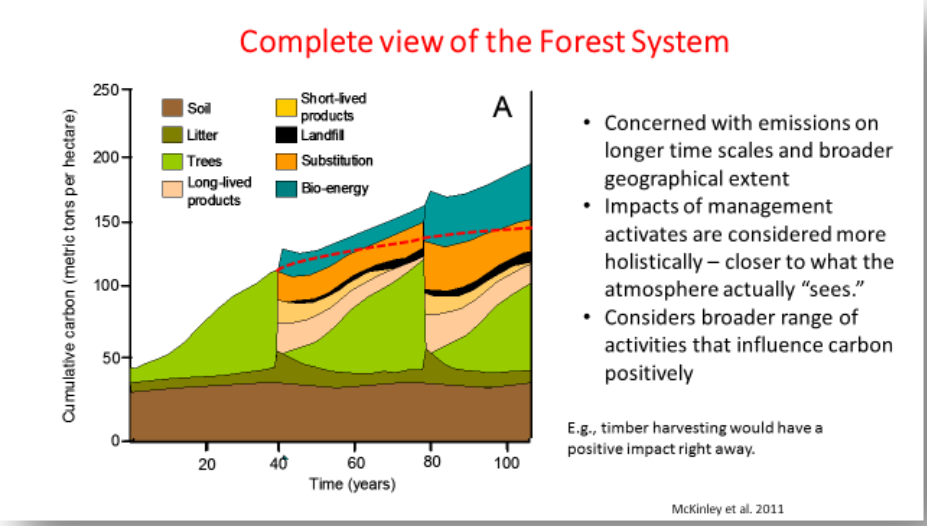

Figure 1. Carbon balance from a hypothetical forest management project. Considering wood products, their disposition, and substitution effects shows the forest system more completely.

Forests are in continual flux, emitting carbon into the atmosphere, removing carbon from the atmosphere, and storing carbon as biomass (sequestration) (Figure 1). Over the long term, through one or more cycles of disturbance and regrowth, net carbon storage is often zero because regrowth of trees recovers the carbon lost in the disturbance and decomposition of vegetation killed by the disturbance (Kashian et al. 2006, Ryan et al. 2010, McKinley et al. 2011). Within the National Forest System, forests are not converted to other land uses, and long-term net carbon storage is thus maintained.

U.S. forests are a strong net carbon sink, absorbing more carbon than they emit (Houghton 2003, Heath et al. 2011, EPA 2015).

In the most recent National Greenhouse Gas Inventory (EPA 2015), current annual forest (public and private ownership) carbon sequestration was reported at 211.5 teragrams (Tg) of carbon, offsetting approximately 11.6 percent of U.S. greenhouse gas emissions in 2013. Carbon stored in harvested wood products (HWP) contributes to the total forest carbon storage. Harvest treatments that generate long-lived wood products, such as lumber and furniture, transfer ecosystem carbon to the HWP carbon pool where carbon remains stored and doesn't contribute to net greenhouse gas emissions (USDA 2016a). In 2012, HWP carbon stocks represented roughly 2.16% of total forest carbon storage associated with national forests in the Northern Region (USDA 2015, Figure 1).

In the Northern Region, total forest carbon (forest ecosystem and harvested wood products) sequestration is estimated at 5.83 Tg carbon per year for the baseline period of 1990 to 2013 (USDA 2015). This represents roughly 3% of the total carbon sequestered by U.S. forests. Fire, insect, and disease disturbance have the greatest effect on carbon storage on national forest lands

of the Northern Region, yet these typically affect less than 1% of the total forested area each year (USDA 2016b). Harvest affects an even smaller percentage of National Forest land, and does not have a long-term effect on carbon sequestration or storage because the land is not converted from forest to a different land use (Conant et al. 2007, Ryan et al. 2010, McKinley et al. 2011).

Effects to Carbon Cycling

Summary: Neither no action nor the proposed action would have a measurable impact on carbon stocks in either the short nor long term, because the area of treatment is a small fraction relative to regional and global carbon stocks.

Direct and Indirect Effects

No Action

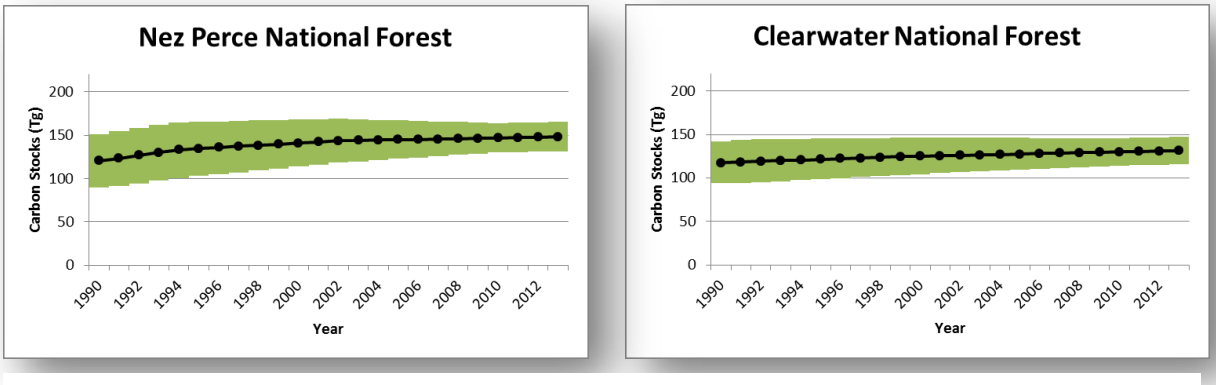

Figure 2 Figure 2. Total Forest Ecosystem Carbon Stocks and Uncertainty Estimates (95% confidence level) (USDA, 2015)

Carbon is expected to continue sequestration at similar fluctuations as estimated for 1990 to 2013 (Figure 2 and Figure 3) with fire and insect and disease more greatly contributing to the changes in carbon storage under no action (Figure 4).

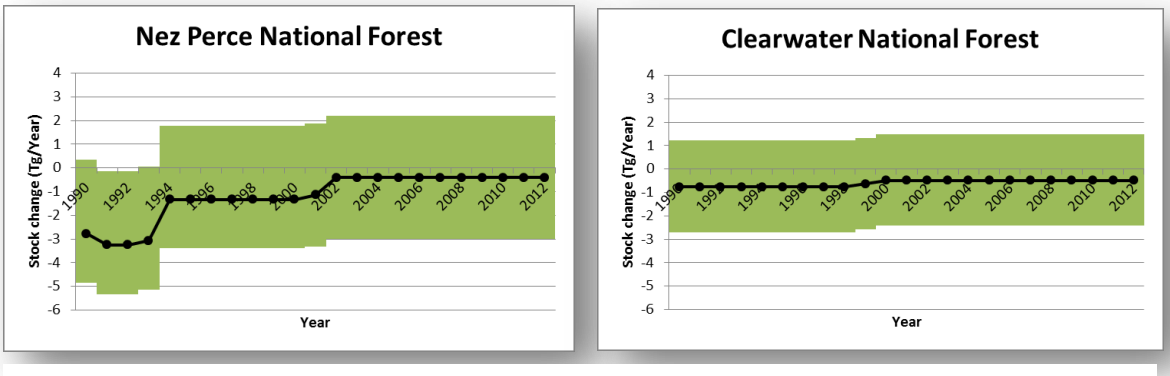

Figure 3. Carbon Stock Change and Uncertainty Estimates (95% confidence level). A negative change in the graphs below means carbon is being removed from the atmosphere and sequestered by the forests (i.e., carbon sink) while a positive change means car

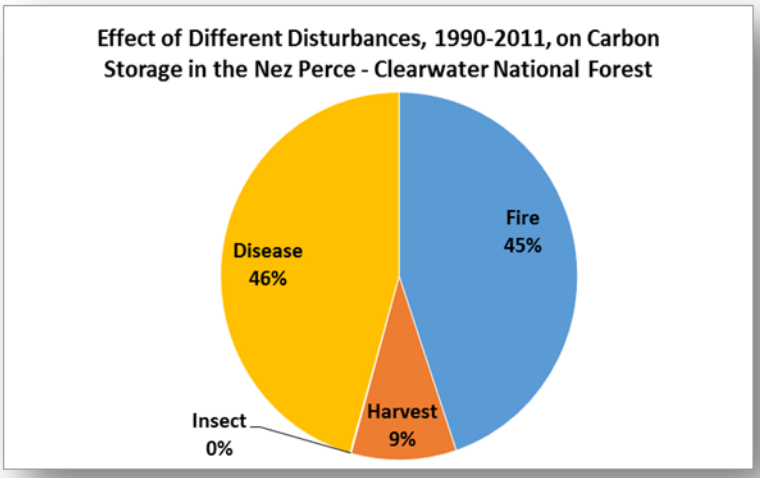

Figure 4. The effect of fire, insect/disease, and harvest on carbon storage in each national forest of the Northern Region for the period 1990 – 2011. (USDA 2017)

Because the acres in the project proposal represent a relatively small area in the context of regional and global carbon stocks, differences in effects between the no action and proposed action are negligible.

Proposed Action

In the short term, the proposed action would remove some carbon currently stored in live biomass by cutting timber in the treatment units. A substantial portion of this carbon would remain stored for a period of time in wood products (Depro et al. 2008, U.S. Environmental Protection Agency 2010), reducing some of the carbon emitted through decomposition. "*In the context of total forest carbon, including both ecosystem carbon and HWP carbon, we estimate that the Northern Region HWP carbon stocks represent roughly 2.16% of total forest carbon*

storage associated with national forests in the Northern Region in 2012." (USDA 2015). See (Figure 5). In the proposed action slightly more carbon would be stored in wood products than in biomass.

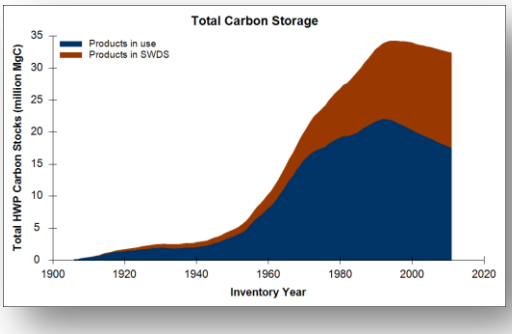

Figure 5. Cumulative total carbon stored in HWP manufactured from Northern Region timber using the IPCC/EPA approach. Carbon in HWP includes both products that are still in use and carbon stored at solid waste disposals sites (SWDS), including landfills and dumps (Stockmann et al. 2014).

In the long term, the forest will regrow and accumulate carbon, thus acting as a carbon sink (Figure 6). The proposed reforestation in the proposed action would help ensure these forest stands return to a carbon sink as quickly as possible.

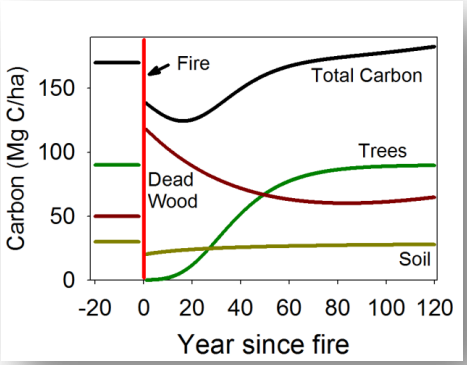

Figure 6. If a forest regenerates after a fire and the recovery is long enough, the forest will recover the carbon lost in the fire and in the decomposition of trees killed by the fire. This concept is illustrated here by showing carbon stored in forests as live trees, dead wood, and soil and how these pools change after fire. Model output is from an analysis published in Kashian et al. 2006.

Motorized equipment used during the proposed action would emit a small quantity of greenhouse gases, but the impact that this would have on the atmospheric CO_2 concentration is not considered here in detail because it's contribution is relatively small, difficult to determine, and cannot be appropriately analyzed at the project scale. The atmospheric carbon pool is global in nature and is influenced by global markets that make the effects of forest or even regional-scale actions highly uncertain (Murray 2008). Motorized equipment associated with timber harvest in any specific forest or stand will only affect the global CO_2 pool if harvest does not occur elsewhere in the world to supply the same world demand for timber (Wear and Murray 2004, Gan and McCarl 2007, Murray 2008). If the timber resulting from harvest is used in the marketplace to replace products such as steel or concrete that cause more carbon emissions during production, timber harvest may provide a small net reduction in the atmospheric CO_2 concentration (Harmon et al. 2009, Ryan et al. 2010, McKinley et al. 2011).

Cumulative Effects

The Nez Perce-Clearwater has consistently functioned as a carbon source and sink since 1990 and is anticipated to continue functioning as such. It is anticipated forest will remain forested on the Nez Perce-Clearwater and not be converted to other land uses. Fluctuation in carbon stores and accumulation into the near future (i.e., 20 to 50 years) would continue to occur, consistent with the natural variation that would be expected in an ecosystem influenced mostly by natural

disturbance regimes and ecosystem processes. Impacts of fire and insect/disease on forest cover and potential loss of carbon is greater than that that of harvest activity.

The combined Nez Perce-Clearwater National Forests represent a very small amount of the carbon stored in forests in the United States (Heath et al. 2011). Given the available data and tools (USDA 2015; USDA 2016a), patterns and trends of carbon dynamics are best determined at larger scales and over long periods of time. This project and others taking place on the Forest will at most affect a very small percentage of the forest carbon stocks, and a small fractional proportion of the total forest carbon stocks of the United States. The affected forest lands in this proposal would remain forests, not be converted to other land uses, and long-term forest services and benefits would be maintained. As such, the long term cumulative effects of forest management will have little impact overall on a potential future scenario of carbon accumulation and loss.

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